

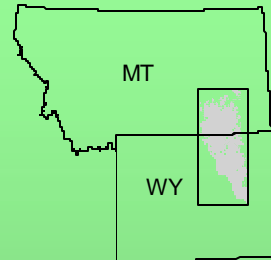
A quick look at the Powder River Basin and related coalbed-methane issues

John Wheaton

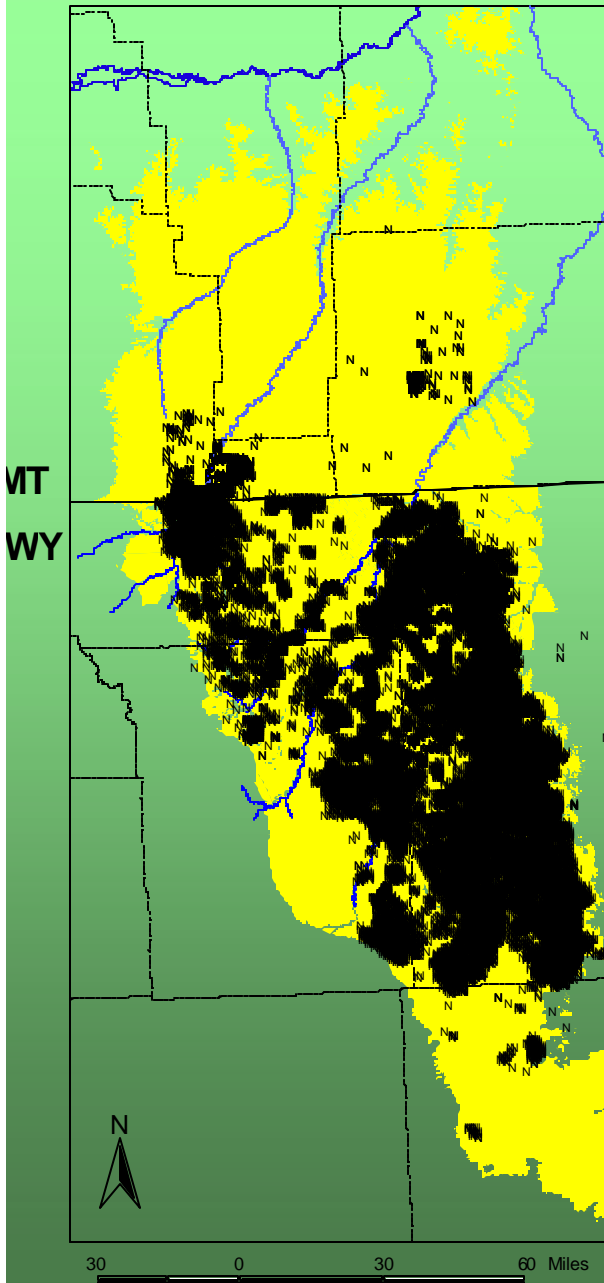
With appreciative acknowledgement to Ed Deal and other MBMG staff for information and slides



N Location of CBM wells and permits in the Powder River Basin



Montana
1342 permits
Wyoming
42,484 permits
(April, 2006)



Restoration Economy Issue

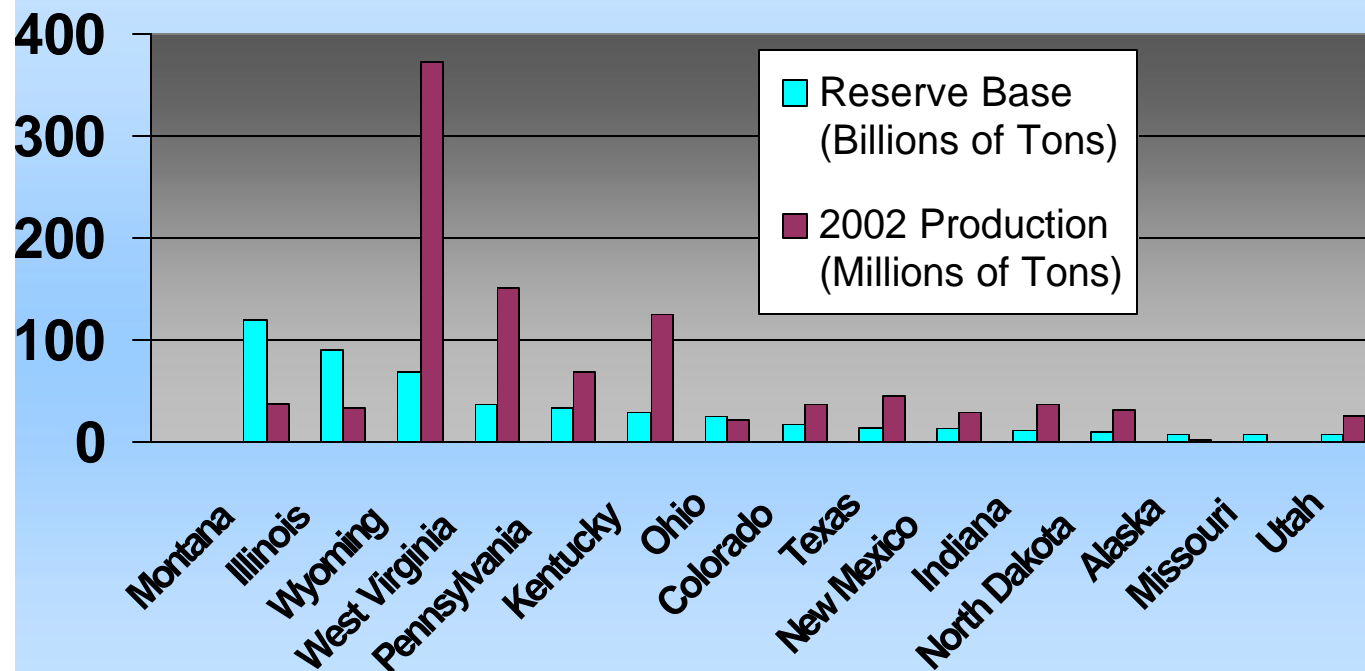
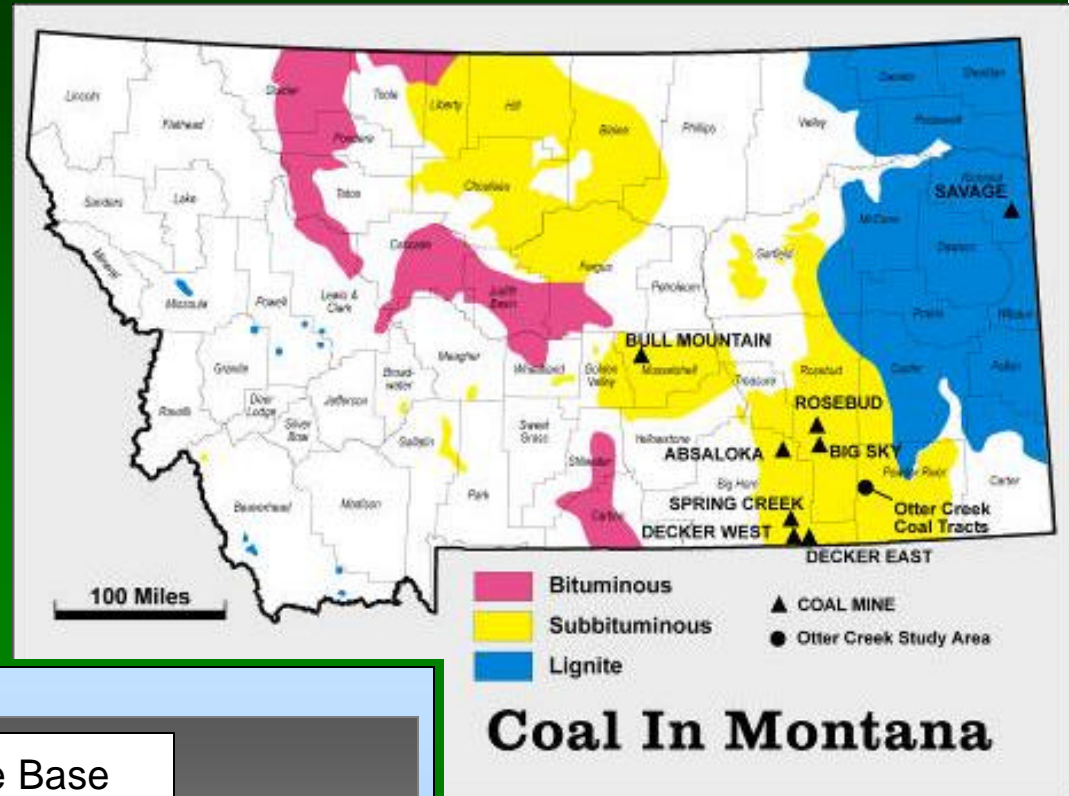
- Post – Development Land Use

It was an agricultural land use

It is now a shared ag – CBM land use

Can it return to an ag based land use ?

Montana's got coal



Coal Reserve Base and Production Ranking by State

Source: U.S. Energy Information Administration

Where's the controversy with Coalbed Methane ?



Controversy decreases development
Understanding decreases controversy



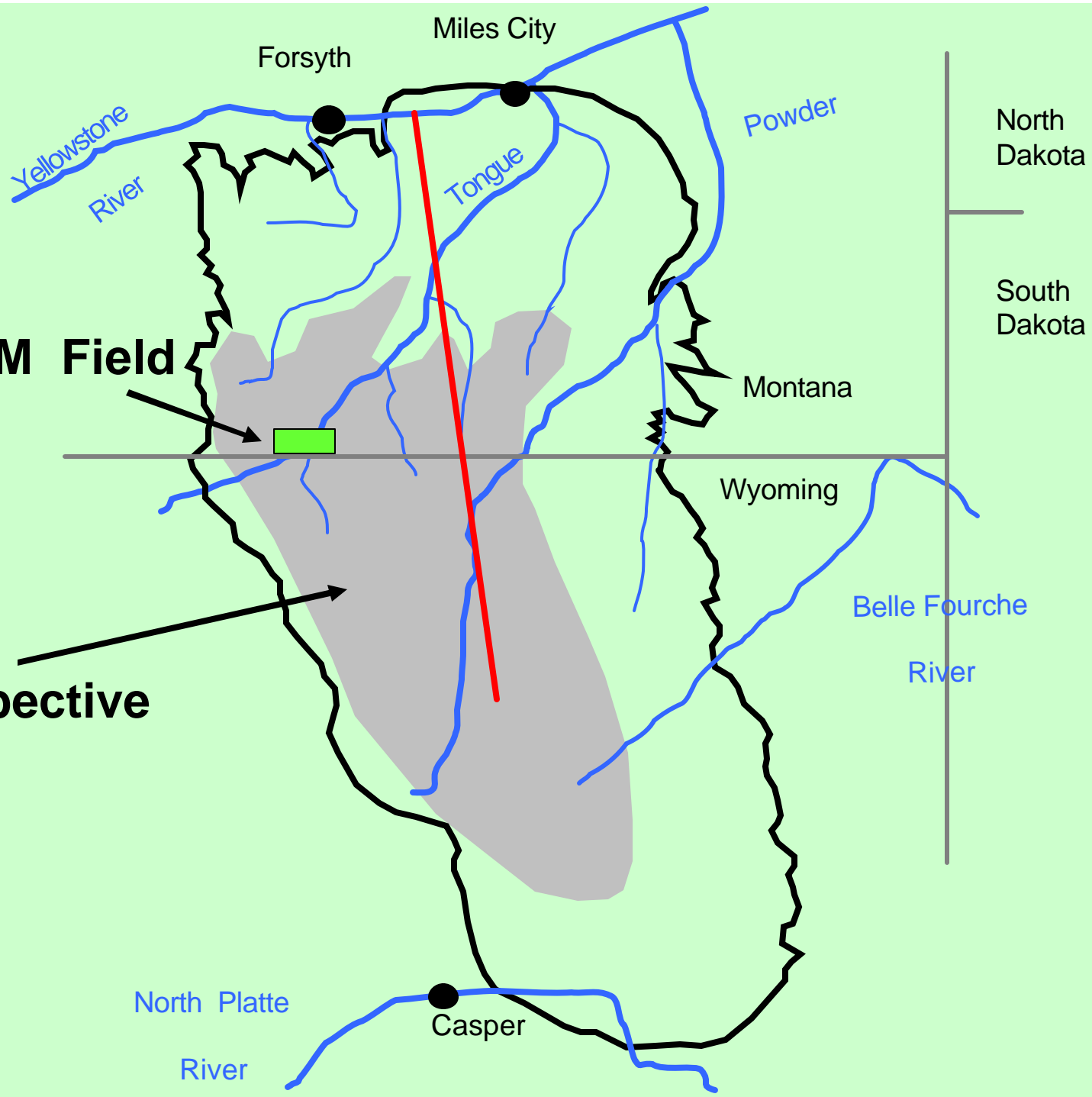
Some of the issues with CBM in the PRB

- **Wyoming CBM resources >>> Montana CBM resources**
(All states are not equal)
- Economic development
- Surface rights & split estates
- **Ground Water - One key controversy**

Understanding the resource in Montana

CX CBM Field

**Area prospective
for CBM**



Powder River Basin, Montana

South - to - North Cross Section

South

North

Wasatch Fm
(Sandy soils,
few springs)

Wyoming

Montana

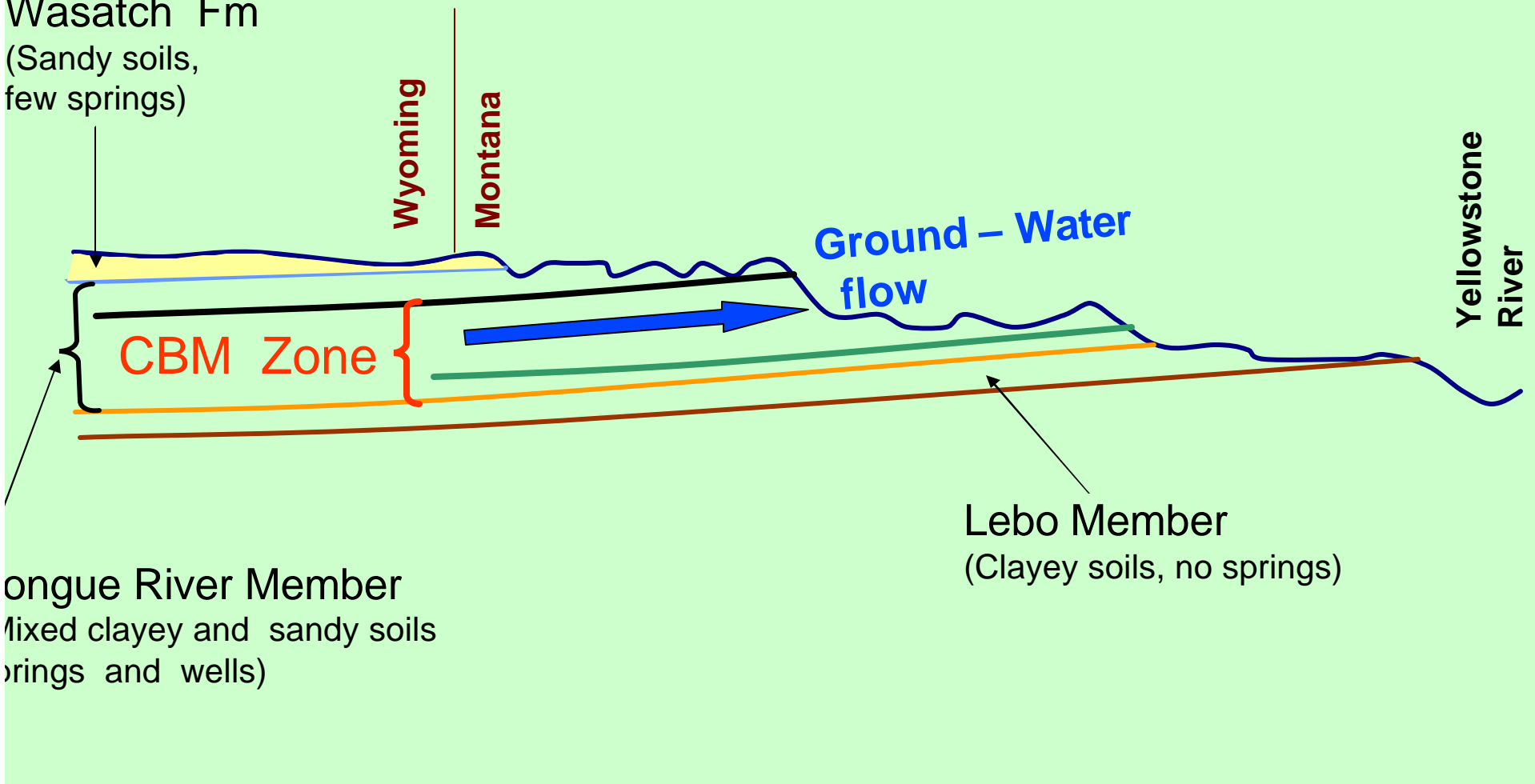
Ground - Water
flow

Yellowstone
River

CBM Zone

Longue River Member
(Mixed clayey and sandy soils
springs and wells)

Lebo Member
(Clayey soils, no springs)



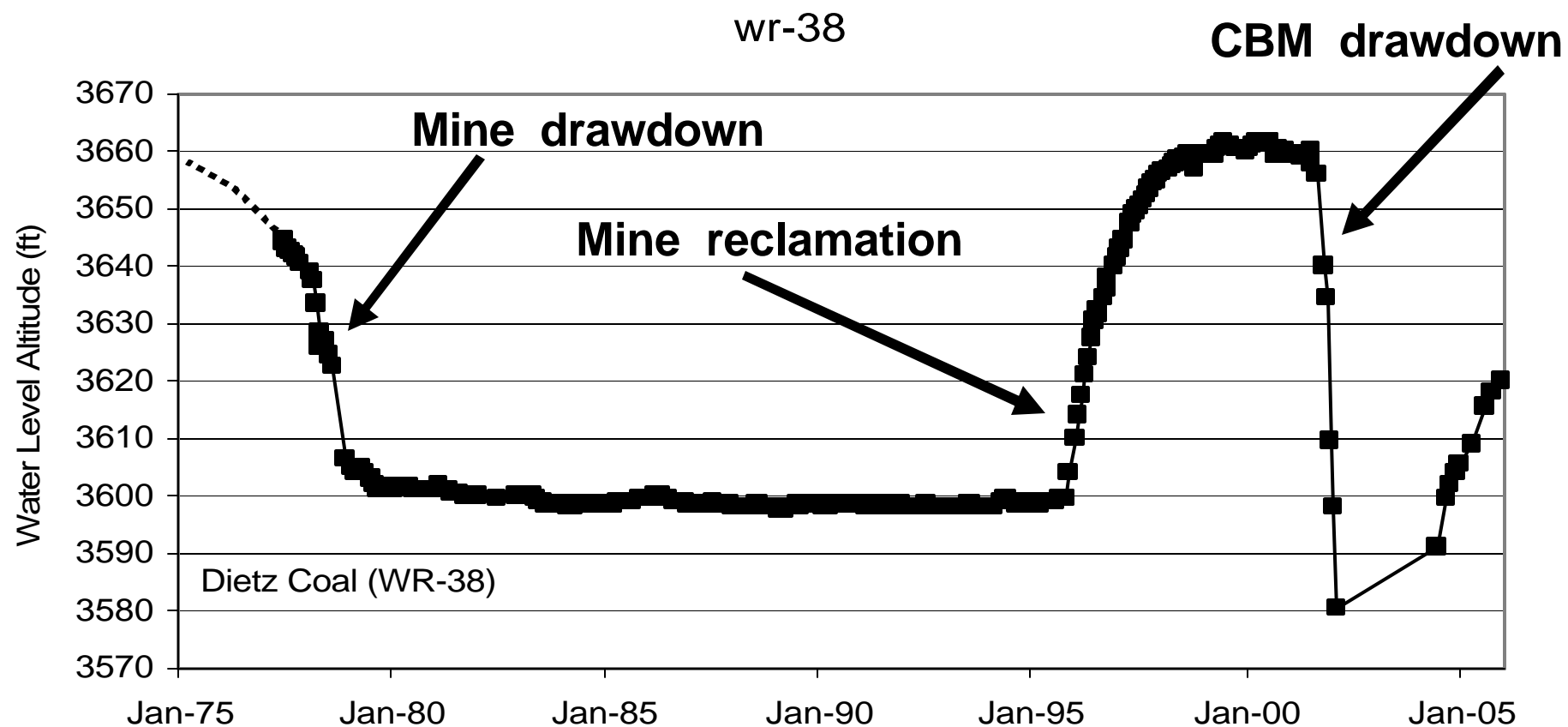
Ground Water :

Aquifer drawdown

**The coal beds are the aquifers.
CBM production results in lots of
water pumped.**

**Decreased water available at
some wells and springs.**

Idealized aquifer drawdown and recovery

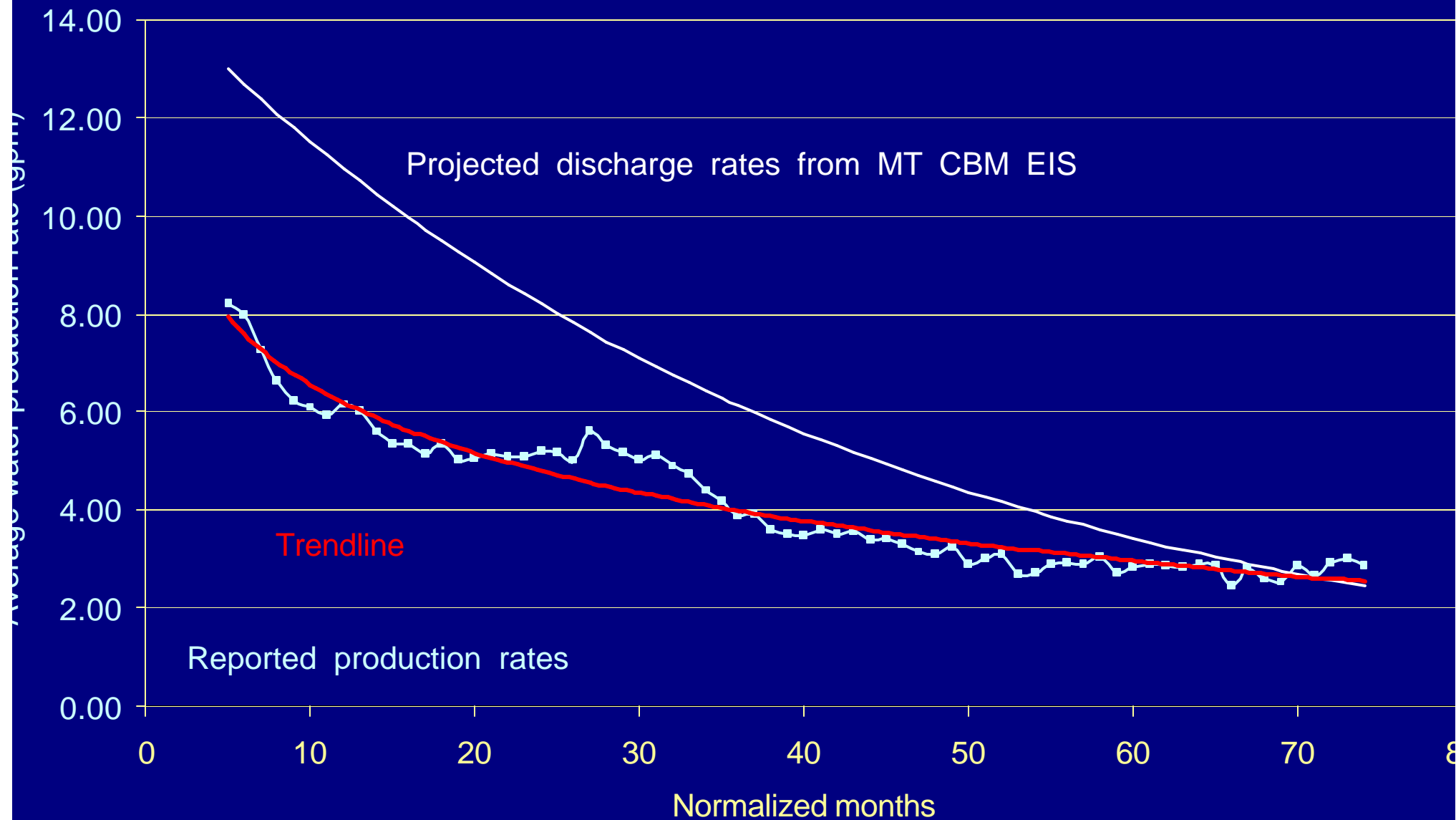


Produced water management

CBM – Produced Water Management Goals

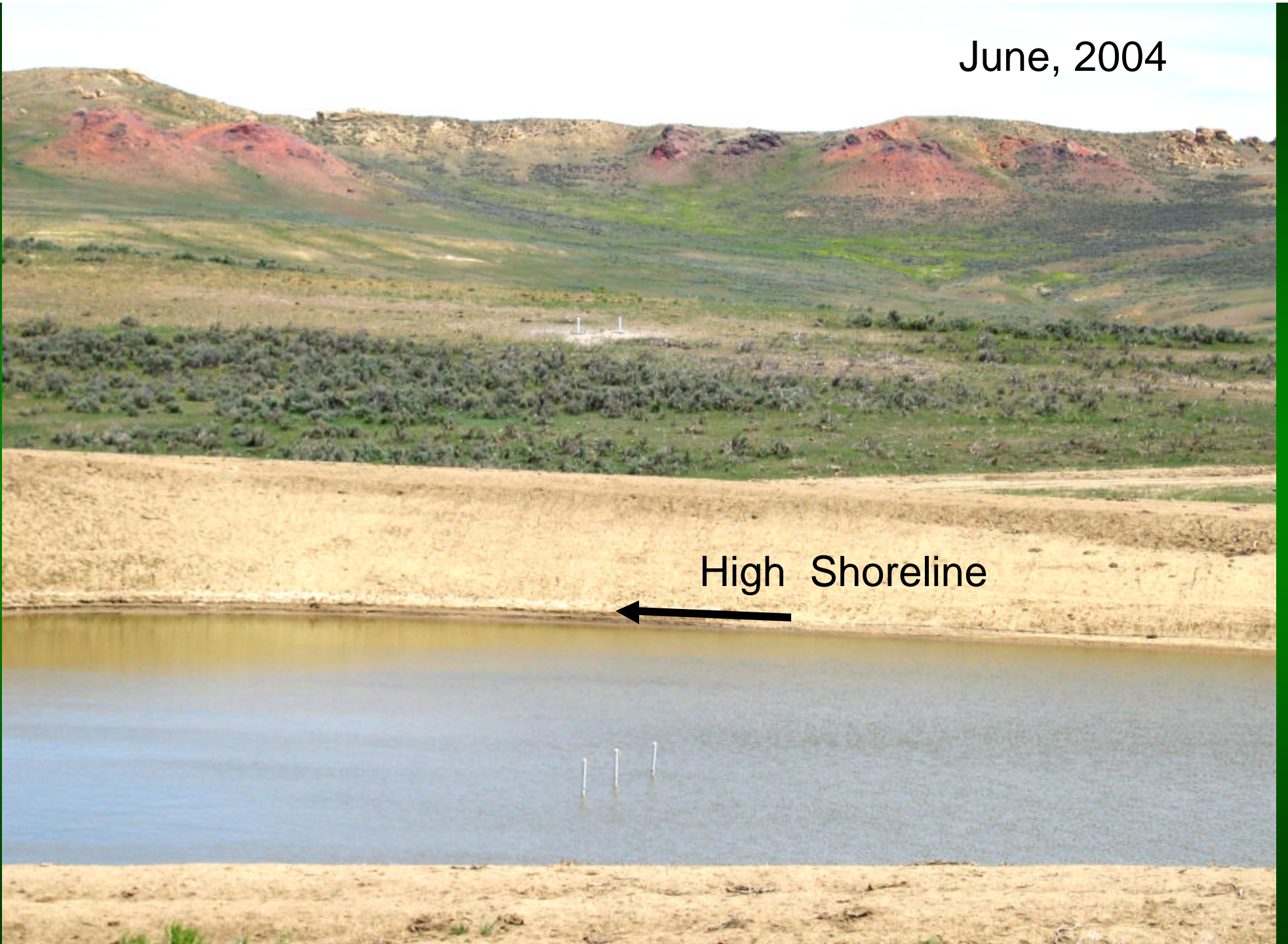
- Economically dispose of produced water
- Conserve or protect water resource
- Limit liability of water quality - Na, HCO₃

Actual water production curve



June, 2004

High Shoreline





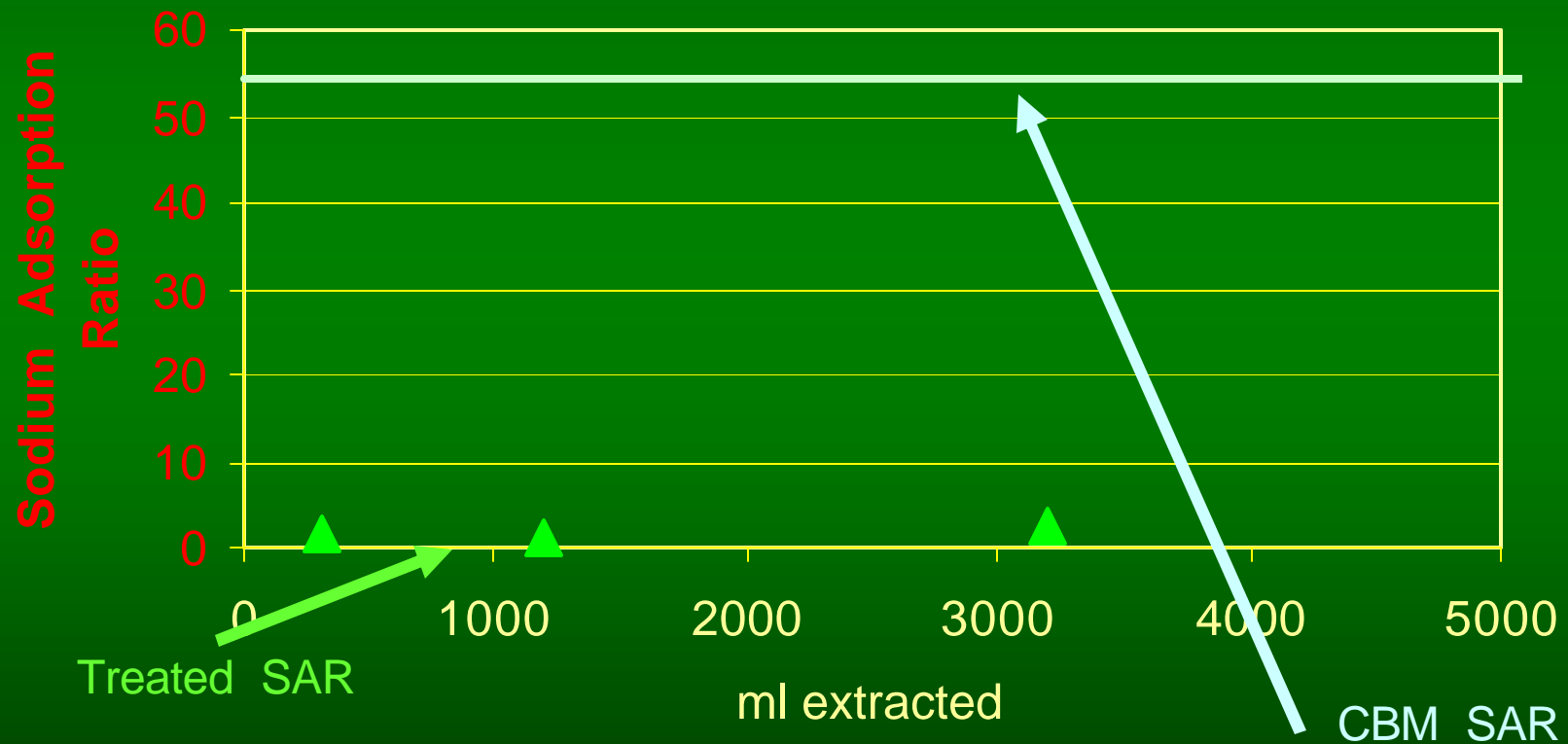
Subsurface Drip Irrigation





Treatment with a mined product ??

Leonardite
5 pore volumes



Use of the Scientific Method for decision making

- 1. Observation**
- 2. Hypothesis**
- 3. Experimental Design**
- 4. Data Collection**
- 5. Interpretation of Data**
- 6. Peer Review and Publication**

SUMMARY

Coalbed methane represents economic development.

Reclamation during CBM production and planning for water replacement and recovery can allow return to long-term agricultural (or other) land use.

Science must be applied properly.

There are solutions, and there will be more.

